



DATE: 10 July 2012

I.T.L. (PRODUCT TESTING) LTD.

FCC Radio Test Report

for

AeroScout Ltd.

Equipment under test:

External Antenna

ANT-4200

Written by: _____

I. Smilansky, Documentation

Approved by: _____

A. Sharabi, Test Engineer

Approved by: _____

I. Raz, EMC Laboratory Manager

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This report relates only to items tested.



TABLE OF CONTENTS

1.	GENERAL INFORMATION -----	4
1.1	Administrative Information	4
1.2	List of Accreditations	5
1.3	Product Description	6
1.4	Test Methodology	6
1.5	Test Facility	6
1.6	Measurement Uncertainty	6
2.	SYSTEM TEST CONFIGURATION-----	7
2.1	Justification	7
2.2	EUT Exercise Software	Error! Bookmark not defined.
2.3	Special Accessories	7
2.4	Equipment Modifications	7
2.5	Configuration of Tested System	7
3.	TEST SET-UP PHOTOS-----	8
4.	CONDUCTED EMISSION DATA -----	9
4.1	Test Specification	9
4.2	Test Procedure	9
4.3	Test Results.....	9
4.4	Test Equipment Used, Conducted Measurement	14
5.	AVERAGE FACTOR CALCULATION-----	15
5.1	Test Equipment Used.....	17
6.	FIELD STRENGTH OF FUNDAMENTAL -----	18
6.1	Test Specification	18
6.2	Test Procedure	18
6.3	Test Results.....	18
6.4	Test Equipment Used, Field Strength of Fundamental	20
7.	RADIATED EMISSION, 9 KHZ – 30 MHZ-----	21
7.1	Test Specification	21
7.2	Test Procedure	21
7.3	Test Results.....	21
7.4	Test Instrumentation Used, Radiated Measurements	23
7.5	Field Strength Calculation	23
8.	SPURIOUS RADIATED EMISSION-----	24
8.1	Test Specification	24
8.2	Test Procedure	24
8.3	Test Results.....	24
8.4	Test Equipment Used, Radiated Measurements.....	25
9.	11. APPENDIX A - CORRECTION FACTORS-----	26
9.1	Correction factors for CABLE	26
9.2	Correction factors for CABLE	27
9.3	Correction factors for LOG PERIODIC ANTENNA	28
9.4	Correction factors for BICONICAL ANTENNA	29
9.5	Correction factors for ACTIVE LOOP ANTENNA	30



1. General Information

1.1 Administrative Information

Manufacturer:	AeroScout Ltd.
Manufacturer's Address:	3 Pekeris St. Einstein Entrance 4th Floor Rehovot 76702 Israel Tel: +972-8-9369393 Fax: +972-8-9365977
Manufacturer's Representative:	Leonid Gnusin Dadi Matza
Equipment Under Test (E.U.T):	External Antenna
Equipment Model No.:	ANT-4200
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	18.03.2012
Start of Test:	18.03.2012
End of Test:	19.03.2012
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Part 15 Subpart C



1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025B-1.
6. TUV Product Services, England, ASLLAS No. 97201.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.



1.3 Product Description

The ANT-4200 is an external LF antenna for the EX-4200 and EX-200NB exciters. It has two internal antennas and a driving circuit housed in a plastic enclosure. It is powered by 12 VDC and 125 KHz signal which it receives directly from the connection to either an EX-4200 or EX-2000B exciter, and transmits it via the antennas.

1.4 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing September 06, 2009). I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 Measurement Uncertainty

Radiated Emission

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site 30-1000MHz:

Expanded Uncertainty (95% Confidence, K=2):

± 4.96 dB

Conducted Emission

Conducted Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4)

0.15 – 30 MHz:

Expanded Uncertainty (95% Confidence, K=2):

± 3.44 dB

2. System Test Configuration

2.1 *Justification*

Unit was tested while transmitting continuously at maximum power and most radiated orientation.

2.2 *Special Accessories*

No special accessories were needed.

2.3 *Equipment Modifications*

No modifications were needed in order to achieve compliance

2.4 *Configuration of Tested System*

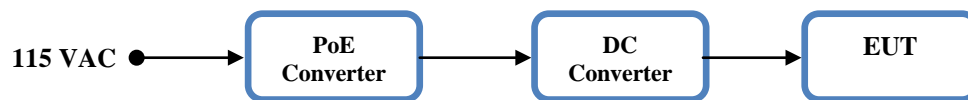


Figure 1. Configuration of Tested System

3. Test Set-up Photos



Figure 2. Radiated Emission Test 9 kHz – 30 MHz



Figure 3. Radiated Emission Test 30 -1000 MHz



Figure 4. Conducted Emission



4. Conducted Emission Data

4.1 Test Specification

F.C.C., Part 15, Subpart C

4.2 Test Procedure

The E.U.T operation mode and test set-up are as described in Section 3.1. In order to minimize background noise interference, the conducted emission testing was performed inside a shielded room, with the E.U.T placed on an 0.8 meter high wooden table, 0.4 meter from the room's vertical wall.

The E.U.T was powered from 115 V AC / 60 Hz via a 50 Ohm / 50 μ Hn Line Impedance Stabilization Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T

The center of the E.U.T AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

The emission voltages at the LISN's outputs were measured using a computerized receiver, complying with CISPR 16 requirements. The specification limits are loaded to the receiver via a 3.5" floppy disk and are displayed on the receiver's spectrum display.

A frequency scan between 0.15 and 30 MHz was performed at 9 kHz I.F. band width, and using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak and average detector.

4.3 Test Results

JUDGEMENT: Passed by 11.8 dB

The margin between the emission levels and the specification limit is, in the worst case, 11.8 dB for the phase line at 0.19 MHz and 12.9 dB at 0.19 MHz for the neutral line.

The EUT met the F.C.C. Part 15, Subpart C specification requirements.

The details of the highest emissions are given in *Figure 5* to *Figure 8*.

TEST PERSONNEL:

Tester Signature: _____

Date: 24.09.12

Typed/Printed Name: A. Sharabi



Conducted Emission

E.U.T Description External Antenna
Type ANT-4200
Serial Number: Not Designated

Specification: FCC Part 15, Subpart C

Lead: Phase

Detectors: Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.189319	53.1	52.3	-11.8	40.7	-13.4	0.0
2	0.239363	47.9	46.5	-15.7	35.1	-17.0	0.0
3	1.095175	31.2	30.7	-25.3	29.9	-16.1	0.0
4	5.394234	33.6	32.5	-27.5	31.8	-18.2	0.0
5	10.079463	34.1	32.2	-27.8	30.1	-19.9	0.0
6	16.729828	36.4	33.8	-26.2	31.1	-18.9	0.0

Figure 5. Detectors: Peak, Quasi-peak, Average.

Note: QP Delta/Av Delta refer to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Conducted Emission

E.U.T Description External Antenna
Type ANT-4200
Serial Number: Not Designated

Specification: FCC Part 15, Subpart C
Lead: Phase
Detectors: Peak, Quasi-peak, Average



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 190 kHz
51.52 dB μ V

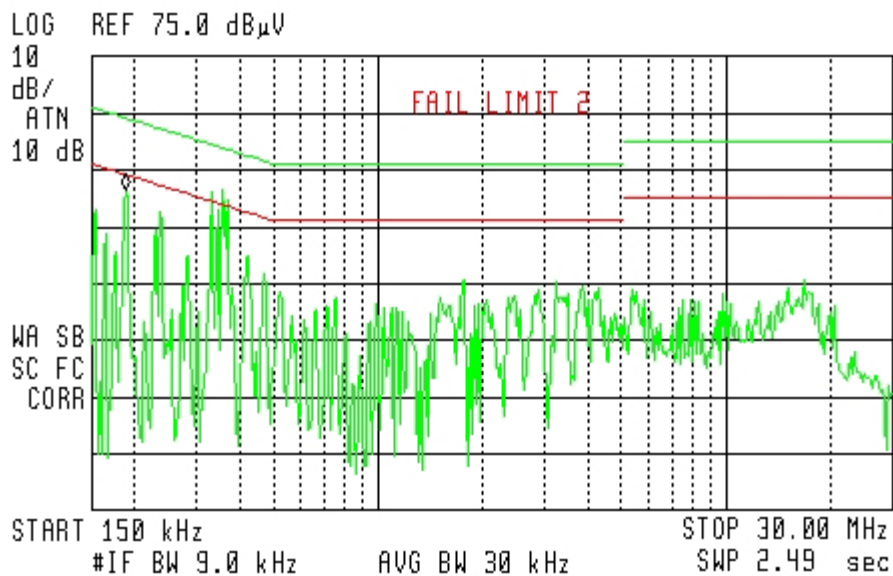


Figure 6. Detectors: Peak, Quasi-peak, Average

Note: Fail indication on the spectral plot results from peak detector level reading above the limit. This indication is for information only and it should not be interpreted as a test failure.



Conducted Emission

E.U.T Description External Antenna
Type ANT-4200
Serial Number: Not Designated

Specification: FCC Part 15, Subpart C

Lead: Neutral

Detectors: Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.190289	52.5	51.1	-12.9	39.6	-14.4	0.0
2	0.530595	22.4	17.5	-38.5	16.3	-29.7	0.0
3	2.517211	33.2	31.8	-24.2	30.0	-16.0	0.0
4	3.276109	36.7	35.6	-20.4	31.5	-14.5	0.0
5	9.829363	34.1	32.4	-27.6	30.0	-20.0	0.0
6	16.187468	37.2	35.0	-25.0	31.0	-19.0	0.0

Figure 7. Detectors: Peak, Quasi-peak, Average

Note: QP Delta/Av Delta refer to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Conducted Emission

E.U.T Description External Antenna
Type ANT-4200
Serial Number: Not Designated

Specification: FCC Part 15, Subpart C
Lead: Neutral
Detectors: Peak, Quasi-peak, Average



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKA 190 kHz
50.28 dB μ V

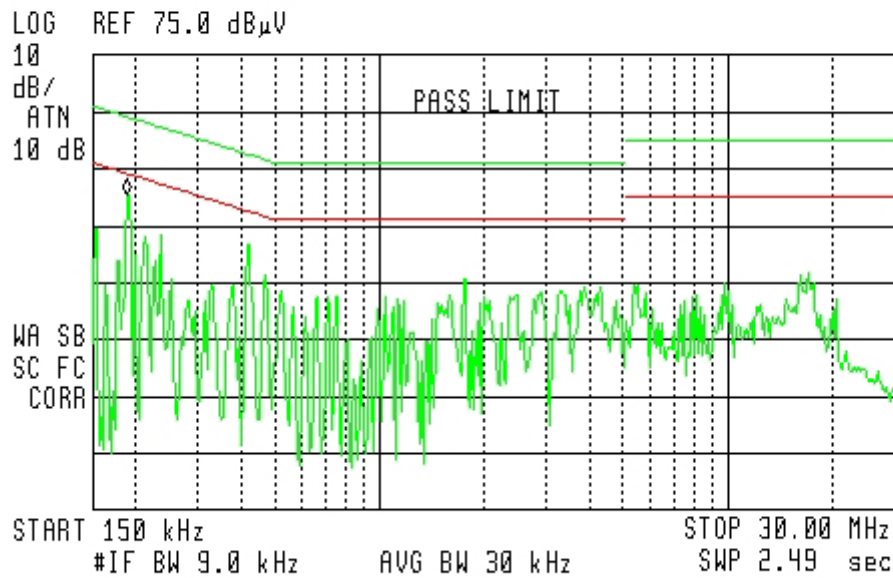


Figure 8 Conducted Emission: NEUTRAL
Detectors: Peak, Quasi-peak, Average

Note: Fail indication on the spectral plot results from peak detector level reading above the limit. This indication is for information only and it should not be interpreted as a test failure.



4.4 Test Equipment Used, Conducted Measurement

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
LISN	Fischer	FCC-LISN-2A	127	March 3 , 2012	1 Year
EMI Receiver	HP	85422E	3906A00276	December 12 , 2011	1Year
RF Filter Section	HP	85420E	3705A00248	December 12 , 2011	1Year
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

Figure 9 - Test Equipment Used

5. Average Factor Calculation

1. Pulse period = 720usec (worst scenario)
2. Pulse duration = 360usec (worst scenario)
3. Burst duration = 70.0msec
4. Time between bursts = 207.5msec
5. Average Factor = $20 \log \left[\frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{burst duration}}{100\text{msec}} \times \text{Num of burst within 100msec} \right]$

$$\text{Average Factor} = 20 \log \left[\frac{360}{720} \times \frac{70}{100} \right] = -9.1\text{dB}$$

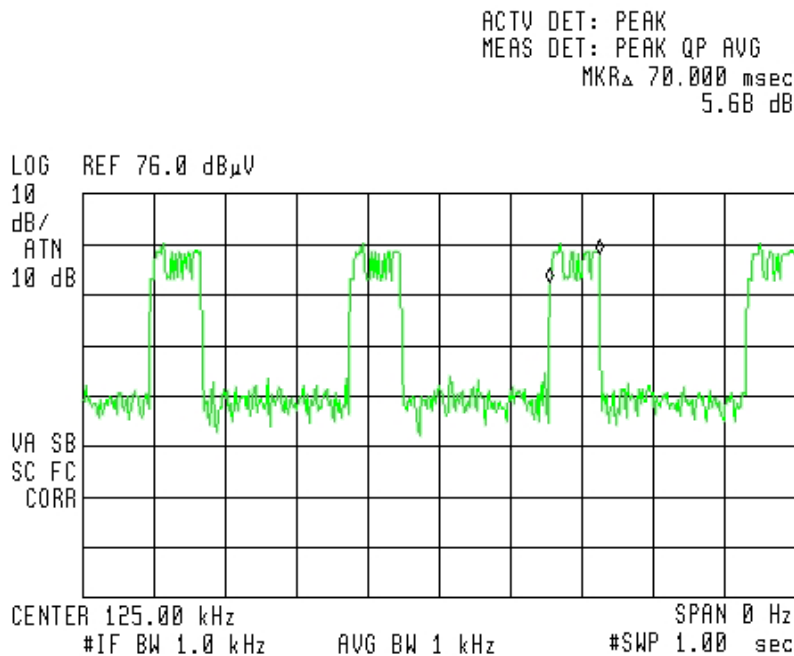


Figure 10. Transmission Burst Duration = 70.0 msec



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR Δ -207.50 msec
-8.81 dB

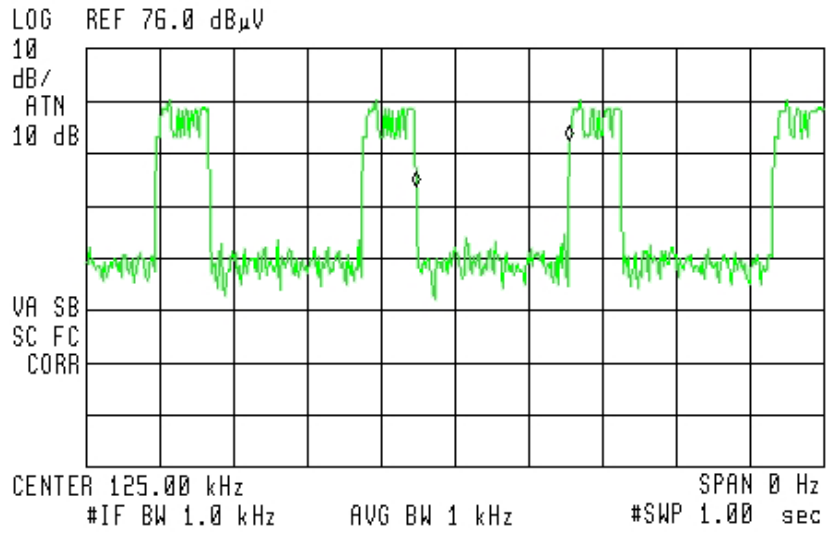


Figure 11. Time between Bursts = 207.5 msec



5.1 Test Equipment Used

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	December 12 , 2011	1 year
RF Section	HP	85420E	3705A00248	December 12 , 2011	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 19 , 2011	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

Figure 12. Test Equipment Used



6. Field Strength of Fundamental

6.1 Test Specification

F.C.C., Part 15, Subpart C

6.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

The E.U.T. was placed on a non-conductive table, 0.8 meters above the O.A.T.S. ground plane.

The EMI receiver was set to the E.U.T. Fundamental Frequency (125 kHz) and Peak Detection.

The distance between the E.U.T. and test antenna was 3 meters.

The turntable and antenna were adjusted for maximum level reading on the EMI receiver. The loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter.

The average result is:

$$\text{Peak Level(dB}\mu\text{V/m)} + \text{Average Factor (dB)}$$

6.3 Test Results

JUDGEMENT: Passed by 35.3 dB

The EUT met the FCC Part 15, Subpart C specification requirements.

The details of the highest emissions are given in *Figure 13*.

TEST PERSONNEL:

Tester Signature:  Date: 24.09.12

Typed/Printed Name: A. Sharabi

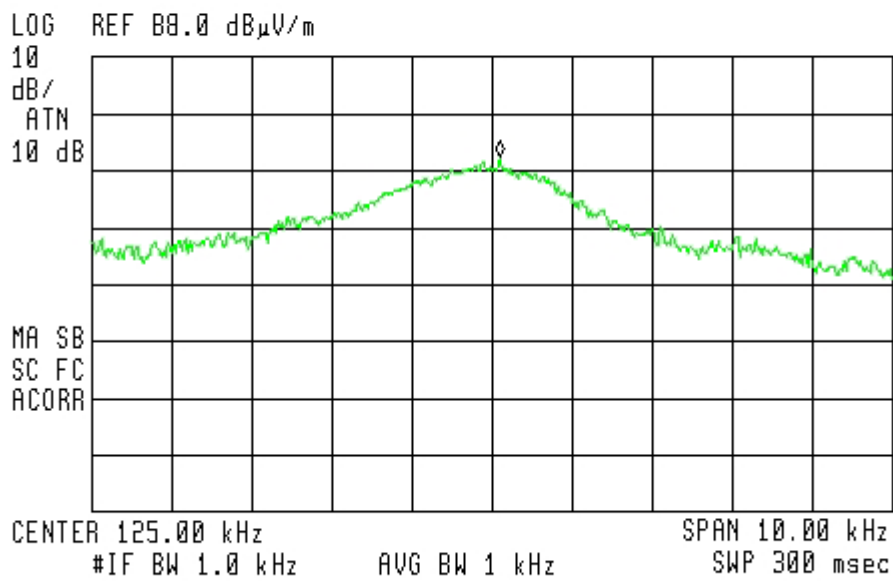


Field Strength of Fundamental

E.U.T Description External Antenna
Type ANT-4200
Serial Number: Not Designated



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 125.10 kHz
70.31 dB μ V/m



**Figure 13. Field Strength of Fundamental.
Detector: Peak**

Average Limit = 105.67dB μ V/m



6.4 Test Equipment Used, Field Strength of Fundamental

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	December 12 , 2011	1 year
RF Section	HP	85420E	3705A00248	December 12 , 2011	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 19 , 2011	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

Figure 14. Test Equipment Used



7. Radiated Emission, 9 kHz – 30 MHz

7.1 Test Specification

9 kHz-30 MHz, FCC, Part 15, Subpart C, Section 209

7.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The frequency range 9 kHz-30 MHz was scanned.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 9 kHz-30MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter at a distance of 10 meters.

The E.U.T. was operated at the frequency of 125 kHz. This frequency was measured using a peak detector.

7.3 Test Results

JUDGEMENT: Passed by 32.9 dB

The EUT was tested and it met the requirements of the FCC Part 15, Subpart C, specification.

TEST PERSONNEL:

Tester Signature: 

Date: 24.09.12

Typed/Printed Name: A. Sharabi



Radiated Emission

E.U.T Description External Antenna
Type ANT-4200
Serial Number: Not Designated

Specification: FCC Part 15, Subpart C

Antenna: 3 meters distance

Frequency range: 9 kHz to 30 MHz

Detectors: Peak

Frequency (kHz)	Peak Reading (dB μ V/m)	Average Factor (dB)	Average Result (dB μ V/m)	Average Specification (dB μ V/m)	Margin (dB)
375.00	44.0	-9.1	34.9	96.12	-61.22
625.00	37.6	-9.1	28.5	71.69	-43.19
875.00	31.0	-9.1	21.9	68.73	-46.83
1125.00	42.8	-9.1	33.7	66.58	-32.88

**Figure 15. Radiated Emission. Antenna Polarization: HORIZONTAL.
Detectors: Peak, Quasi-peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.



7.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	December 12 , 2011	1 year
RF Section	HP	85420E	3705A00248	December 12 , 2011	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 19 , 2011	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A

Figure 16. Test Equipment Used

7.5 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$FS = RA + AF + CF$$

FS: Field Strength [dB μ v/m]

RA: Receiver Amplitude [dB μ v]

AF: Receiving Antenna Correction Factor [dB/m]

CF: Cable Attenuation Factor [dB]

Example: FS = 30.7 dB μ V (RA) + 14.0 dB (AF) + 0.9 dB (CF) = 45.6 dB μ V

No external pre-amplifiers are used.



8. Spurious Radiated Emission

8.1 Test Specification

30 - 1000 MHz, F.C.C., Part 15, Subpart C

8.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3. See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in *Figure 3*.

The signals from the list of the highest emissions were verified and the list was updated accordingly.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization. Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.)

The emissions were measured at a distance of 3 meters.


8.3 Test Results

JUDGEMENT: Passed

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification.

No signals were detected in the frequency range of 30 -1000 MHz.

TEST PERSONNEL:

Tester Signature: 

Date: 24.09.12

Typed/Printed Name: A. Sharabi



8.4 Test Equipment Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	December 12 , 2011	1 year
RF Section	HP	85420E	3705A00248	December 12 , 2011	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	November 12, 2011	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 29 , 2011	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

Figure 17. Test Equipment Used



9. APPENDIX A - CORRECTION FACTORS

9.1 Correction factors for CABLE from EMI receiver to test antenna at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3	1200.0	7.3
20.0	0.6	1400.0	7.8
30.0	0.8	1600.0	8.4
40.0	0.9	1800.0	9.1
50.0	1.1	2000.0	9.9
60.0	1.2	2300.0	11.2
70.0	1.3	2600.0	12.2
80.0	1.4	2900.0	13.0
90.0	1.6		
100.0	1.7		
150.0	2.0		
200.0	2.3		
250.0	2.7		
300.0	3.1		
350.0	3.4		
400.0	3.7		
450.0	4.0		
500.0	4.3		
600.0	4.7		
700.0	5.3		
800.0	5.9		
900.0	6.3		
1000.0	6.7		

NOTES:

1. The cable type is RG-214.
2. The overall length of the cable is 27 meters.
3. The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".



9.2 Correction factors for CABLE
from EMI receiver
to test antenna
at 3 meter range.

FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.2
2.0	1.6
3.0	2.0
4.0	2.4
5.0	3.0
6.0	3.4
7.0	3.8
8.0	4.2
9.0	4.6
10.0	5.0
12.0	5.8

NOTES:

- 1. The cable type is RG-8.*
- 2. The overall length of the cable is 10 meters.*



9.3 Correction factors for LOG PERIODIC ANTENNA

Type LPD 2010/A at 3 and 10 meter ranges.

Distance of 3 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.1
250.0	10.2
300.0	12.5
400.0	15.4
500.0	16.1
600.0	19.2
700.0	19.4
800.0	19.9
900.0	21.2
1000.0	23.5

Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.8
400.0	15.3
500.0	15.6
600.0	18.7
700.0	19.1
800.0	20.2
900.0	21.1
1000.0	23.2

NOTES:

1. Antenna serial number is 1038.
2. The above lists are located in file number 38M30.ANT for a 3 meter range, and file number 38M100.ANT for a 10 meter range.
3. The files mentioned above are located on the disk marked "Radiated Emission Test EMI Receiver".



**9.4 Correction factors for BICONICAL ANTENNA
Type BCD-235/B,
at 3 meter range**

FREQUENCY (MHz)	AFE (dB/m)
20.0	19.4
30.0	14.8
40.0	11.9
50.0	10.2
60.0	9.1
70.0	8.5
80.0	8.9
90.0	9.6
100.0	10.3
110.0	11.0
120.0	11.5
130.0	11.7
140.0	12.1
150.0	12.6
160.0	12.8
170.0	13.0
180.0	13.5
190.0	14.0
200.0	14.8
210.0	15.3
220.0	15.8
230.0	16.2
240.0	16.6
250.0	17.6
260.0	18.2
270.0	18.4
280.0	18.7
290.0	19.2
300.0	19.9
310	20.7
320	21.9
330	23.4
340	25.1
350	27.0

NOTES:

- 1. Antenna serial number is 1041.*
- 2. The above list is located in file 19BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".*



9.5 Correction factors for ACTIVE LOOP ANTENNA

Model 6502

S/N 9506-2950

FREQUENCY (MHz)	Magnetic Antenna Factor (dB)	Electric Antenna Factor (dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2